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KUBOVCIK & KUBOVCIK
SUITE 1105
1215 SOUTH CLARK STREET
ARLINGTON, VA 22202

EXAMINER	
NGUYEN, TU MINH	

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/600,571
Filing Date: June 23, 2003
Appellant(s): HORI ET AL.

Ronald J. Kubovcik
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on March 1, 2010 appealing from the Office action mailed on June 10, 2009.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 17-19, 21, 22, 24, 25 and 29 are pending in this application. Claims 17-19, 21, 22, 24, 25 and 29 are finally rejected and are under appeal.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

5,402,641	KATOH ET AL.	4-1995
5,075,276	OZAWA ET AL.	12-1991

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 17-19, 21, 22, 24, 25, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katoh et al. (U.S. Patent 5,402,641) in view Ozawa et al. (U.S. Patent 5,075,276).

Re claim 17, as illustrated in Figures 1 and 5, Katoh et al. disclose a process for purifying exhaust gas from lean burning internal combustion engines using an exhaust gas purifying catalyst (6) containing a noble metal (platinum) and a transition metal (copper) (see line 61 of column 3 to line 3 of column 4) and which removes hydrocarbons, carbon monoxide, and nitrogen oxides from the exhaust gas, comprising:

- providing a gasoline engine (2) of the carburetor type;

- injecting gasoline into a cylinder of the gasoline engine to provide a mixture of air and gasoline having an air-fuel ratio of 13 to 15 and combusting the mixture to form an exhaust gas in a first exhaust gas state (stoichiometric or rich air-fuel ratio) having an exhaust-gas temperature in a range of 350°C to 800°C at an inlet to the catalyst (step 106 with YES answer and step 108) (in step 108, the first exhaust gas state is stoichiometric with an air-fuel ratio of 14.7); wherein the catalyst being obtained by mixing the noble metal and the transition metal with or carrying the noble metal and the transition metal by a fire-resistant inorganic oxide, the fire-resistant inorganic oxide being active alumina (line 62 of column 3);

- contacting the exhaust gas in the first exhaust gas state with the catalyst to remove hydrocarbons, carbon monoxide, and nitrogen oxides from the first exhaust gas and purify the first exhaust gas (see at least Figure 3B and lines 23-28 of column 4);

- injecting gasoline into the cylinder of the gasoline engine to provide a mixture of air and gasoline having an air-fuel ratio of more than 15 to 50 (see lines 25-26 of column 5) and combusting the mixture to form an exhaust gas in a second exhaust gas state (lean air-fuel ratios) having an exhaust-gas temperature being in a range of 200°C to 350°C at the inlet to the catalyst (step 106 with NO answer and step 110); and

- contacting the exhaust gas in the second exhaust gas state with the catalyst to remove hydrocarbons, carbon monoxide, and nitrogen oxides from the second exhaust gas and purify the second exhaust gas (see at least Figure 3A and lines 15-23 of column 4).

Katoh et al., however, fail to disclose that their engine is a gasoline fuel-direct-injection type engine which allows fuel to be directly injected inside a cylinder of the engine; and that an amount of the noble metal being in a range of 0.01 to 50 g/liter with respect to the catalyst volume, the fire-resistant inorganic oxide having a BET surface area of 50 m^2/g to 200 m^2/g and having a pore diameter of 10 nm to 30 nm.

Katoh et al. disclose the claimed invention except for applying the invention to a gasoline fuel-direct-injection type engine. It would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the invention of Katoh et al. to a gasoline fuel-direct-injection type engine, since the recitation of such amounts to an intended use statement. Note that both "gasoline fuel-direct-injection engine" and "gasoline carburetor-injection engine" generate exhaust gases containing harmful emissions of HC, NOx, soot, CO, and SOx, that require purification before the gases can be released to the atmosphere; and the mere selection of the purification process of Katoh et al. for use in a gasoline fuel-direct-injection engine would be well within the level of ordinary skill in the art.

Ozawa et al. disclose a catalyst adapted to purify hydrocarbons, carbon monoxide, and NOx in the exhaust gas of an internal combustion engine. As indicated on lines 15-62 of column 6, Ozawa et al. teach that their catalyst comprises a catalytically active coating having a platinum metal group and a high surface area support material. The platinum metal group is in a density range of 0.01 to 5 g/liter of the catalyst volume (see line 57 of column 6). The high surface area

support material is a fire-resistant inorganic oxide (gamma alumina) having a BET surface area of 50 m^2/g to 200 m^2/g and having a pore diameter of 10 nm to 30 nm (300 angstrom = 30 nm) (see lines 16-20 of column 6). As depicted in Figure 2, Ozawa et al. further teach that their catalyst has relatively high purification efficiencies of HC, CO, and NOx based on said composition of the catalyst. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the density range of platinum and the inorganic oxide taught by Ozawa et al. in the catalyst of Katoh et al., since the use thereof would have provided a catalyst having high efficiencies in removing HC, CO, and NOx emissions in the exhaust gas.

Re claim 18, in the modified process of Katoh et al., the exhaust gas in the second exhaust gas state (lean air-fuel ratio) forms a more oxidizing, low-temperature atmosphere as compared with the first exhaust gas state (stoichiometric or rich air-fuel ratio).

Re claim 19, in the modified process of Katoh et al., the first exhaust-gas state (stoichiometric or rich air-fuel ratio) is a state at a time of high output of the gasoline engine of a fuel-direct-injection type, and the second exhaust-gas state (lean air-fuel ratio) is a state at a time of low output of the gasoline engine (see at least Figure 13 and lines 24-41 of column 10).

Re claim 21, in the modified process of Katoh et al., the transition metal (copper) is at least one selected from the group consisting of manganese, iron, cobalt, copper, and nickel.

Re claim 22, in the modified process of Katoh et al., the catalyst includes at least one noble metal (platinum) selected from the group consisting of platinum, rhodium, palladium and iridium.

Re claim 24, in the modified process of Katoh et al., the catalyst includes platinum and rhodium as the noble metal (see lines 65-66 of column 3).

Re claim 25, in the modified process of Katoh et al., the catalyst includes at least one of a cerium-oxide powder and a zirconium-oxide powder (see Table 2 and lines 50-62 of column 4 in Ozawa et al.).

Re claim 29, in the modified process of Katoh et al., when the temperature of the exhaust gas at the inlet of the catalyst is higher than 500°C, the catalyst is unable to reduce NOx contained in the exhaust gas that is in the second exhaust gas state (the catalyst in Katoh et al. is unable to reduce NOx from the second (lean) exhaust gas state).

(10) Response to Argument

<u>ISSUE 1</u>: With regard to the 35 U.S.C. 103 rejection of independent claim 17, the rejection is improper because the references fail to teach of suggest all of the features and limitations as claimed.

In response to Appellant's argument that the combination of Ozawa et al. with Katoh et al. is improper because neither reference describes a direct fuel-injection gasoline engine (page 5 of the Appeal Brief), the examiner respectfully disagrees.

The claim in the pending application that the pending invention is directed to a direct fuel-injection gasoline engine has been determined as an “intended use statement”. The examiner has noted that most internal combustion engines (which includes the engine in the pending application and the lean burning engine in Katoh et al.) that utilize a hydrocarbon source as a fuel generate exhaust gases containing harmful emissions of HC, NOx, soot, CO, and SOx,

that require purification before the gases can be released to the atmosphere; and the mere selection of the purification process of Katoh et al. for use in a direct fuel-injection gasoline engine would be well within the level of ordinary skill in the art.

Moreover, the purification process in Katoh et al. is applied to an engine capable of running at lean air-fuel ratios (see the Abstract). Since Katoh et al. did not limit their process to a specific hydrocarbon fuel, it is at least obvious to one with ordinary skill in the art that their process is also applied to a gasoline engine that is known to be capable of running at a lean air-fuel ratio. Katoh et al., however, fail to specifically mention that their gasoline engine is a direct injection type. Even if the engine in Katoh et al. is a carburetor type, the examiner maintains that such engine still generates exhaust gases containing harmful emissions of HC, NOx, soot, CO, and SOx, that require purification before the gases can be released to the atmosphere; and the mere selection of the purification process of Katoh et al. for use in a direct fuel-injection engine would be well within the level of ordinary skill in the art.

In response to the Appellant's argument that the combination of Ozawa et al. with Katoh et al. is still improper because Katoh et al. fail to teach or suggest i) an exhaust gas that is purified at the claimed temperature ranges, and ii) the claimed air-fuel ratios that are specified at the claimed temperature ranges (pages 6-8 of the Appeal Brief), the examiner again respectfully disagrees.

The examiner has shown in Figure 5 that Katoh et al. clearly disclose or teach the steps of providing a mixture of air and gasoline having an air-fuel ratio of 13 to 15 and combusting the mixture to form an exhaust gas in a first exhaust gas state (stoichiometric or rich air-fuel ratio) having an exhaust-gas temperature in a range of 350°C to 800°C at an inlet to the catalyst (step

106 with YES answer and step 108) (in step 108, the first exhaust gas state is stoichiometric with an air-fuel ratio of 14.7); and providing a mixture of air and gasoline having an air-fuel ratio of more than 15 to 50 (see lines 25-26 of column 5) and combusting the mixture to form an exhaust gas in a second exhaust gas state (lean air-fuel ratio) having an exhaust-gas temperature being in a range of 200°C to 350°C at the inlet to the catalyst (step 106 with NO answer and step 110). Thus, Katoh et al. clearly disclose or teach the claimed limitations in dispute.

ISSUE 2: With regard to the 35 U.S.C. 103 rejections of independent claim 17, the rejection is improper because there is no or little reasonable expectation of success.

In response to Appellant's argument that since Katoh et al. disclose a NOx absorbent, they fail to disclose or teach an exhaust gas purifying catalyst that removes hydrocarbons, carbon monoxide, and nitrogen oxides from the exhaust gas (page 9 of the Appeal Brief), the examiner again respectfully disagrees.

As illustrated in Figure 3A, the NOx absorbent (6) in Katoh et al. is adapted to adsorb nitrogen oxides (NOx) in an exhaust gas stream during a second exhaust gas state (lean air-fuel ratio). From Figure 3B, the NOx absorbent is caused during a first exhaust gas state (stoichiometric or rich air-fuel ratio) to release and reduce the adsorbed NOx. As can be seen in Figure 3B and indicated on lines 14-28 of column 4, the released NOx during the first exhaust gas state is chemically combined with hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas stream to form harmless compounds of water, nitrogen, and carbon dioxide which are then released to the atmosphere. Thus, the catalyst in Katoh et al. is clearly adapted to remove hydrocarbons, carbon monoxide, and nitrogen oxides from the exhaust gas. And since

Appellant has defined an "exhaust gas purifying catalyst" as a device that removes hydrocarbons, carbon monoxide, and nitrogen oxides from the exhaust gas (see the pre-amble of claim 17), it is clear that the NOx absorbent (6) in Katoh et al. is indeed an exhaust gas purifying catalyst.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Tu M. Nguyen/
Tu M. Nguyen
Primary Examiner
Art Unit 3748

tmn
May 19, 2010

Conferees:

/Thomas E. Denion/
Supervisory Patent Examiner
Art Unit 3748

/Eric K Nicholson/
RQAS -3700